

The Development and Management of Tidal Wetlands  
in Southeast Asia

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Introduction

Coastal areas increasingly are the focal point in economic development schemes. As a result of increased shortage of land, and the growth in the demand for goods and services, coastal ecosystems in Southeast Asia are being allocated to development of aquaculture, agriculture, forestry, mineral extraction, population relocation, and urban expansion. These activities provide new opportunities for regional or national development of land and water based resources. Coastal ecosystems, however, are fragile and their exploitation is limited by the natural forces which created and maintain them. Saline or acid sulphate soils and natural hazards such as storms and flooding make these complex systems marginal areas for development.

Tidally influenced lands, principally mangrove and swamp forests, are viewed in Southeast Asia as under-utilised resources. The development of these lands, commonly termed "reclamation", is seen as a means of coping with a range of social problems including the need to:

- (a) increase food production by agriculture of aquaculture
- (b) a replacement for offshore fisheries no longer available
- (c) re-settle people displaced by development projects or, help redistribute population by providing land for landless families; and
- (d) stimulate regional development

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These tidal lands generally are not densely populated, and seemingly have low intensities of resource use; these factors, together with the inherent potential of the wetland areas, lead government officials and planners to formulate large-scale, often single-purpose schemes for their development.

Usually these schemes involve major investments in infrastructure and reclamation works to transform tidal lands into agricultural fields or aquaculture ponds. Tidal wetlands, however, are a prime example of complex land and water systems whose resource attributes are neither fully understood from an ecological perspective nor valued comprehensively in economic terms. Similarly, the social aspects relative to the use of these resource systems by the indigenous cultures is poorly understood. Our lack of understanding of the ecologic, economic and social parameters of tidal wetlands development should cause us to proceed cautiously in making major changes in the nature, scale or rate of exploitation of these resources. Major changes are, however taking place in the tidal wetlands of Asia and there is mounting concern about the long-term impact of current policies and programmes which commit wetlands to uncontrolled development and irreversible change.

#### Improving the evaluation of wetland resources

Several considerations, vitally important in properly evaluating the merits and disbenefits of altering these lands, are generally overlooked. These include:

- (a) the ecological role of tidal wetlands in supporting diverse resource development activities and in maintaining the functional integrity of coastal ecosystems;

- (b) the economic and social significance of the environmental and pecuniary goods and services provided at little or not cost to man by tidal lands in their natural state;
- (c) the low chemical fertility and physical unsuitability of many of the mineral soils which lower their development potential;
- (d) the high levels of risk and uncertainty associated with the agricultural development of organic soils found in tidal lands; and
- (e) the basic question of whether such development can be sustained in the face of the high levels of capital and management skill required to allow these lands to produce agricultural yields comparable to dryland areas, or yields from aquaculture which approach the loss of natural fishery products resulting from the alteration of swamplands and mangrove.

This list can be extended; it is however sufficiently long to demonstrate a need to heighten the perception of the role of these resources in their present state, and how they may respond to alternative forms of use. If a more comprehensive enquiry into the ecological, economic and social significance of these lands can be stimulated, then it will be possible to demonstrate the relative advantage to individual societies of promoting policies which safeguard the functional integrity of tidal lands and their related resource activities, instead of converting them to new forms of use. It will then be possible to examine alternative methods of meeting the needs of society through the development of other lands or the creation of alternative resource strategies.

A forthcoming /

A forthcoming report\* explores some of the biophysical, economic and social aspects of tidal wetland management in Thailand, Indonesia, and the Philippines. The priorities for developing tidal areas in these countries vary but there are common elements in the resource opportunities and constraints on development faced by these societies. To safeguard the options open to them, these societies share a need to clarify the biophysical and, in turn, socioeconomic significance of their tidal wetlands.

Attempts are being made to devise broader coastal zone management frameworks in Indonesia, Thailand, and the Philippines. These efforts, however, have failed to resolve interagency conflicts in managing complex resources which as tidal swamplands or mangrove. For example, over-exploitation and direct destruction of mangrove and nipa palm swamp forests are considered to be the most serious problems to be faced in coastal management in Southeast Asia\*\*.

Concern /

\* Burbridge, P R and J Stanturf  
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\*\* Concern for the management of mangrove resources was a major theme of the Seminar on Resource Use and Management in the Coastal Zone of the Asian Humid Tropics, held in Bangkok in 1978. The UNESCO/University of Malaya sponsored Asia Symp on Mangrove Environment: Research and Management held in Kuala Lumpur in August 1980, dealt with many of the problems of mangrove conservation and management. Again, a strong theme of this Symposium was concern over the degradation and loss of mangrove in Asia.

Concern is also voiced over the reclamation of peat swamps and swamp forests for agriculture\*. Apart from fears that these landforms will be degraded and resource activities such as fisheries depressed, there is a growing awareness that scarce public capital is being committed to forms of development which cannot be sustained except through continuing high levels of capital expenditure and management expertise. For nations with both a shortage of development funds and limited trained manpower, it is crucial that public and private decision-makers understand the tradeoffs between raising the productivity of existing land uses, such as fishponds or paddy rice, versus the conversion of wetlands to these uses.

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- \* The Third National Symp on the Management of Tidal Swamplands in Indonesia, held in Palembang in February 1979 was devoted to the problems of managing tidal wetlands for agricultural development associated with the Transmigration programme. There was a division of opinion at the Symposium on the long-term biophysical and economic viability of such development.

Some major considerations for the improved management  
of Tidal Wetland Resource Systems

The manner in which societies value their coastal resources is crucial to both the development of those societies and to the integrity of the resource base. Although patterns of land ownership and rights of access to resources differ markedly from Western society, similar concerns are being expressed in many Asian countries over the valuation and allocation of resources. Legislation and detailed management regulations are being developed to safeguard wetland resources in Asia. Despite these measures, complex natural resource systems such as tidal wetlands continue to be degraded, with consequent negative social and economic impacts.

Much of the economic activity in Asian countries is dependent upon primary activities such as agriculture aquaculture, capture fisheries, forestry and mining. Thus management of the tidal lands supporting these activities is of great importance. Neither total preservation nor the complete replacement of natural wetlands with other uses is an appropriate management alternative. A more reasonable mixture is needed of preservation, well managed use (ie conservation) and limited allocation to uses which do not depend upon the functioning of the natural system. The mix of these alternatives will differ between societies, and likely will change over time.

The task of demonstrating the biophysical, social, and economic values of tidally influenced lands is by no means an easy one. Tidally influenced lands such as mangrove provide a good example of complex land and water systems whose resource attributes are neither fully understood from an ecological perspective, nor valued comprehensively in economic terms.

There is a shortage of skilled personnel to collect, analyse, and synthesize information about coastal wetland resources, and then to incorporate this into coastal management programs. The manpower shortage is felt as well in the implementation of existing sectoral management programmes such as forestry, and will become more acute as attempts are made to combine different forms of resource use within the same regional development programme.

These constraints are illustrated in Thailand in regard to mangrove. Staff at the Phuket Marine Biological Station estimated that there are at most 100 trained scientists in Thailand available to examine coastal resources (Chansang and Hyllberg, pers. comm., 1981). These scientists face the task of creating a basic inventory of coastal flora and fauna, work which has been underway for more than 100 years in Europe, but which has barely begun in Thailand. The shortage of manpower and information means that scientists are called upon to advise concerned politicians and government agency officials on issues such as the impact of mining or charcoal production on wetland. The lack of basic research and information on the dynamics of ecological systems over time places the scientist in a very poor position to say what the impact may be of a proposed form of development.

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The biophysical scientist is not alone in this dilemma. The social and economic information available for coastal areas is weak. For example, it is simplistically assumed that by providing land for aquaculture in Thailand, unemployed deep sea fishermen will become fish farmers. This involves a major shift of occupations and complex questions regarding social role or hierarchy may be involved which will prevent the fisherman from benefiting from the planned development.

Attempts to specify preservation, conservation and development areas within the coastal zone, as has been attempted in the Philippines, can do little more than identify broad zones where a greater or lesser degree of control over development should be applied. There are no well-founded criteria for defining what should constitute a preservation area, as opposed to a conservation or development area. The detailed management of resources, such as tidal wetlands found within such broad zones, still will require gathering basic information concerning the biophysical resource base, and the social and economic significance of that base.

Apart from pressures to develop urban areas, communications, and other forms of non-resource specific land uses, the expansion of aquaculture and agriculture are the land uses which will continue to directly affect tidal wetlands in Thailand, Indonesia and the Philippines. Both of these uses will yield higher returns if located on soils which are suited to their needs. Before major expansion of either activity is planned however methods of improving the productivity of existing areas should be examined, so that expansion is not undertaken before it is required.

Existing /



Existing statements about the expansion of aquaculture imply that mangrove areas are both suitable and can be safely converted to shrimp and fish ponds. These conclusions do not appear to be supported by comprehensive studies of the mangrove ecosystem. They overlook as well the probable role of mangrove in supporting mariculture or capture fisheries. A compelling body of scientific opinion exists, suggesting that shrimp and other marine species are dependent on mangrove for some part of their life-cycle. By reducing the area of mangrove in order to extend aquaculture, the viability of adjacent mariculture and other fisheries could be threatened.

Similarly agricultural development of tidal wetlands is limited by the occurrence of acid sulphate potential mineral soils, and infertile deep peat soils. The successful development of tidal wetlands by Banjarese and Buginese spontaneous migrants in Indonesia has occurred because they have avoided these problem soils and have chosen the better sites. Available evidence suggests that many farmers on government sponsored development areas can look forward to declining rice yields, accompanied by higher production costs.

### Conclusion

We have argued for a broader evaluation framework in planning development of marginal coastal wetlands. On the one hand, better appreciation of the social value of existing, diffuse, traditional resource uses of these areas would permit more realistic appraisal of the costs of project that would convert the wetlands to specific, more capital and management intensive uses. Further, an improved understanding is required of the environmental benefits provided by the natural functioning of these ecosystems. On the other hand, the physical constraints posed by these lands, especially the nature of their soil resources, seems to be insufficiently acknowledged, possibly due to the limited inventory information available.

Some specific measures need to be taken to devise a more adaptive approach to management of tidal wetlands in Southeast Asia.

1. Institute a broader evaluation framework for development projects which includes the consideration of alternative resource systems and/or multiple use development;
2. Marshall the existing information from throughout the region and make this available to all the coastal nations: This will both improve the availability of information and will allow scarce scientific manpower and research funds to be applied to key issues. While trade-off analyses must be made within easy society, a sharing of information would benefit all;
3. Identify what is unknown or uncertain, using for example post-hoc analysis of development projects already underway to guide allocation of resources for future research.
4. Design management policies and development projects to be flexible, possibly in modular phases, and certainly able to incorporate new information as it develops. Decisions should be taken with an eye to what future resource options are being foregone by present decisions.